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Origin of density fluctuations and particle transport in a stochastic magnetic field[1] L. LIN, D.L. BROWER, W.X. DING, W.F. BERGERSON, T.F. YATES, UCLA, A.F. ALMAGRI, B.E. CHAPMAN, J.S. SARFF, T.D. THARP, UW-Madison — We present an experimental investigation of the origin of density fluctuations and magnetic fluctuation-induced particle transport associated with tearing instabilities in the MST RFP. Our studies focus on plasma evolution during the sawtooth crash, when the stochastic magnetic field is strongest and density profile relaxation occurs. Measurements are accomplished by combining multiple interferometric techniques, including standard and differential interferometry, as well as Faraday rotation. Both the sign and amplitude of the nonlinearly-driven advection are measured in wavenumber space for the dominant core-resonant modes. Initial measurements show that density fluctuations result from both linear advection and nonlinear three-wave interactions. Observations also reveal the importance of the edge-resonant m=0 mode in mediating nonlinear three-wave interactions which serve to optimize the phase between density and magnetic fluctuations for maximum flux. By removing the m=0 mode resonant surface, density profile relaxation is no longer observed.

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